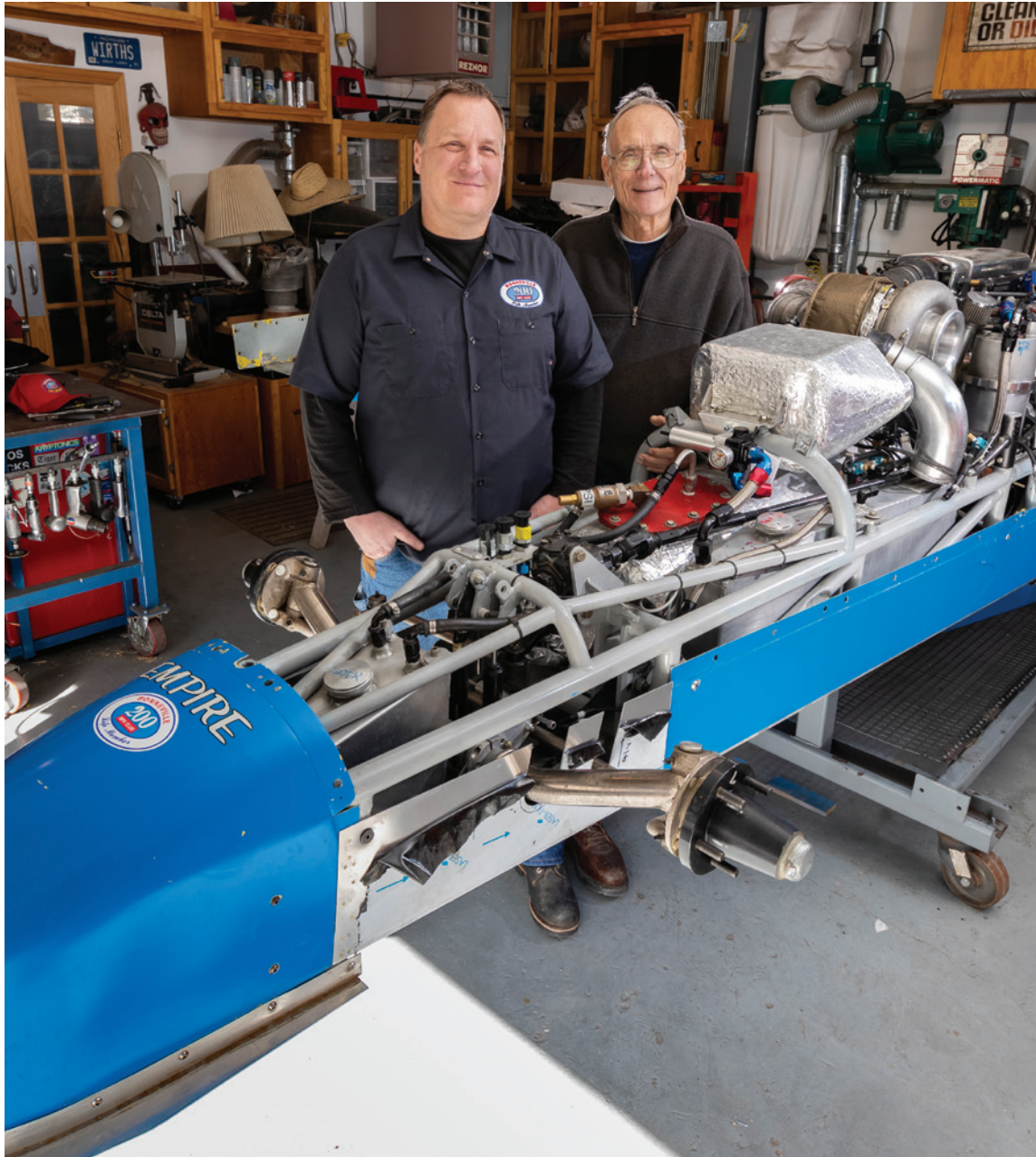




Father, son bond over record-smashing roadster

Duo answers: How many engineers does it take to set vintage-class land-speed record?



RACING TEAM — Sandia’s Joel Wirth, left, and his father and Labs retiree Jack Wirth stand next to their dismantled roadster. Between racing seasons, the car undergoes extensive repairs and improvements in Joel’s home garage.

Photo by Rebecca Gustaf

By **Troy Rummler**

Sandia manager Joel Wirth, a mechanical engineer by training, studied a problem with his car. The weight was too far back, making the car fishtail whenever he drove it faster than 200 mph.

For the past eight years, Joel has been working afterhours in his home garage with his crew chief — his father, Jack Wirth, a retired Sandia electrical engineer. Together, they’ve built one of the fastest 1927 Model T roadsters in the world.

Building the car is more than a pastime. It’s practice. Joel works on the car to immerse himself in the kinds of challenges his Sandia team deals with every day designing national security technologies. Jack Wirth, 83 and a former Sandia manager himself, uses the car to whet his skills and stay active.

The way they work together is modeled after work at Sandia. Racing the car is treated like an experiment: they collect data, analyze it for problems and then go make improvements during the off season.

They’ve been fine-tuning their vehicle this way for years. When the car needed more traction, they mounted a wing behind the cockpit to push down on the rear wheels. When they noticed the car fishtailing at high speeds, they built a vertical fin to keep it straight.

Then, at the end of each summer, Joel straps himself into the car — which moves faster than a small airplane — and gets ready for the next experiment.

Chasing a Bonneville speed record

In August 2018, Joel pushed his car up to the starting line at the Bonneville Salt Flats, an ancient lakebed-turned-speedway in Utah, with his eyes set on breaking the speed record for his car class during Bonneville’s annual Speed Week events.

Despite being classified as a Model T, everything about the Wirths’ car is modern and most

— CONTINUED ON PAGE 6

Cooling unit saves half-million gallons of water

Eventual savings expected to reach 16 million gallons annually for Sandia supercomputer center

By **Neal Singer**

A cooling unit installed on the roof of Sandia’s supercomputer center saved 554,000 gallons of water during its first six months of operation last year, said David J. Martinez, engineering project lead for Sandia’s Infrastructure Computing Services.

The dramatic decrease in water use, important for a water-starved state, could be the model for cities and other large users employing a significant amount of water to cool the thirsty supercomputer clusters springing up like mushrooms around the country, he said.

The unit, called a thermosyphon cooler, also saved more than 195,000 kilowatt hours of electricity during the same period by making it unnecessary to pump thousands of gallons of water around the clock through energy-intensive mechanical chillers.

“We’re testing out the system because that’s what national labs do: we’re among the first to try things,” Dave said. “Others may come along when they see our success.”

Reusable refrigerant

Every bit of electricity used to run the servers of increasingly large supercomputers turns into heat.



SUPER COOLER — Engineering project lead David J. Martinez inspects a thermosyphon cooler on the roof of Sandia’s supercomputer center.

Photo by Randy Montoya

— CONTINUED ON PAGE 7

LABNEWS Notes

Preventive health program supports employees

Knowing and acting on your health status is key to a healthier life

By Shelley Kleinschmidt

Sandia’s Albuquerque medical clinic received 136 patients transported by the Labs’ Emergency Medical Services in fiscal year 2019. Of those, 35% were cardiac- or stroke-related (33% cardiac, 2% stroke).

National news headlines bombard readers with health statistics and it’s pretty easy to tune them out, but when those numbers hit close to home, it grabs our attention.

How well do you know your health status? Sandia’s preventive health and health management teams can help assess your risk for heart disease and stroke, possibly lessening your risk of ending up in an EMS transport.

Citing the 2010 World Economic Forum, Sandia Preventive Health Program Coordinator Callie Lovato said, “Sandia health programs are focused on diminishing the eight risks and behaviors that drive the top 15 chronic conditions and account for 80% of total costs for all chronic illnesses worldwide.”

Without question, preventive efforts are vital when it comes to these top 15 chronic conditions: diabetes, coronary artery disease, hypertension, back pain, obesity, cancer, asthma, arthritis, allergies, sinusitis, depression, congestive heart failure, lung disease, kidney disease and high cholesterol.

Callie said the eight risks and behaviors that lead to these chronic conditions are physical inactivity, smoking, lack of health screenings, poor stress management, poor standard of care, inefficient sleep, excessive alcohol and poor diet. To help make a difference in offsetting such risks and behaviors, “Employee Health Services is committed to engaging as many employees as possible in Sandia’s well-check program,” she said.



IN THE KNOW — Health care provider Johanna Grassham checks Dean Klassy’s vitals during a visit to Sandia’s medical clinic. Photo by Randy Montoya

Sandia uses Wellsource Health Assessment data and its own historical preventive health data to drive program changes onsite in the directions most beneficial to employees. To find out more about their own health status and risks and learn about healthy behavior changes, employees can start by using Sandia’s easy three-step process:

Step 1: Attend a “Know Your Numbers” preventive screening. Send a message to Employee Health Services through the FollowMyHealth Portal or call 505-844-4237 in New Mexico or 925-294-2700 in California to learn about the screenings.

Step 2: Use your screening numbers to complete your Wellsource Health Assessment through Virgin Pulse. The assessment can be completed annually to track health status. Employees who complete the assessment will earn \$250 in their health reimbursement accounts for the following year.

Step 3: Schedule a well-check appointment. Employees can discuss their health assessment results with a health educator and learn how Sandia’s onsite preventive health programs can help address their risks. To schedule a well-check, call 505-844-4237 in New Mexico or 925-294-2700 in California. Employees will earn 3,000 Virgin Pulse points for the visit.

Health Action Plans like the recently revamped Healthy Heart HAP are one example of Sandia’s

health program benefits for employees. Working with a health coach can make a dramatic difference in planning a wellness path.

“The Healthy Heart Health Action Plan works by combining our fitness and nutrition coaching and assessment services in order to develop positive habits and changes for folks trying to combat or manage any number of the 15 chronic conditions,” said Sandia health educator Matt Thomas. “It is one of our most intensive HAPs.”

He added that the HAP operates on a 12-month period of assessment and observation and involves meeting quarterly and working with both a fitness specialist and a registered dietician.

In honor of American Heart Month, Sandia Employee Health Services encourages employees to do their heart a favor and enroll in the Healthy Heart HAP, which can be done prior to or following a well-check appointment.

To get started with a well-check appointment, call 505-844-4237 in New Mexico, or 925-294-2700 in California.

February is American Heart Month

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LABNEWS Notes

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Saving strangers

How one living kidney donor saved six lives

By **Meagan Brace**

More than half of all U.S. adults are registered to donate their organs when they’re deceased, but what if we didn’t have to wait until then to save someone’s life? We don’t. Just ask Lawrence Allen, a Sandia data engineer who made the selfless and courageous decision to become a living organ donor to help a stranger in need.

Humans are equipped with two bean-shaped kidneys on the left and right sides of the spine that are responsible for filtering out waste, making critical hormones and balancing water and salt levels. However, we don’t need both of them.

“In the back of my mind, I thought this would be a cool thing you could do. But more generally, once you realize there are people out there who have no functioning kidneys and are dying because of it, and you have two kidneys and can do with one, it’s kind of self-explanatory that you should try to give them one.”

The Organ Procurement and Transplantation Network reports that there are currently 95,000 people on the national kidney waiting list. In 2019, Lawrence became one of 355 living, anonymous donors who made that list move, joining a total of just 2,770 donors to date.

“People spend an average of five years on the kidney waiting list. The survival rate of dialysis for five years is about 35%,” Lawrence said. “The fact that you make the list move, the people waiting, means that everyone on the list has to wait less time, which means that aside from the people on your chain, you also help a lot of other people in a very subtle way.”

A “chain” is usually set off by a non-directed donor, like Lawrence, who donates a kidney to a recipient whose family member is willing to donate but isn’t a compatible match. In turn, that family member gives their donation to someone else waiting for a transplant. The pattern can continue for multiple recipients.

“If you do a non-directed donation at a place that does chains, your kidney donation will end up with a bunch of other people getting them. So in my case, six other people got kidneys because of it,” he said. “That’s what you want if you are going to anonymously donate a kidney.”

First link in the chain

Lawrence had tried donating multiple times before but ran into various road blocks. After he was hired at Sandia fulltime at the start of 2019, he decided to try one last time before he and his wife had kids.

Local hospitals in Albuquerque allow donations but don’t do chains, so he turned to the Mayo Clinic in Phoenix, Arizona. The process involved filling out a form, passing an initial phone screening and spending four days in Arizona for additional testing.

Once Lawrence got approval from the Mayo Clinic to move forward with the donation, he told



SPARE PARTS — Lawrence Allen checks out a skeleton in Sandia’s medical clinic, where he completed initial screenings to become a living kidney donor. **Photo by Randy Montoya**

his manager, Tom Scriptor, his plans. Tom was very helpful in figuring out how to take time off and complete the HR forms.

“My coworkers were nothing but lovely and supportive, and helped me get my projects into a state where I could take three weeks off,” Lawrence said. “No one ever questioned my right to go do this.”

Throughout the entire process, Lawrence didn’t have to use any vacation. After consulting with HR, he discovered that you can use sick time for medical testing, and many of the initial screenings could be completed at Sandia’s medical clinic.

“That’s one of the biggest ways Sandia helped. We get pretty generous vacation time, but we get lots of sick leave, and you can use sick leave for all of this. You can even get FMLA for it,” he said. “The HR department here is amazing. They were so helpful.”

Lawrence scheduled the surgery for Dec. 16, the Monday after finals and a week and a half before Sandia’s winter shutdown. After one last round of testing in early December, he and his dad went to Arizona for the procedure.

The laparoscopic surgery began around 10 a.m. so that it could go to someone in Phoenix that same day. Lawrence explained that the relatively low-risk surgery takes about 2-3 hours to complete, and after recovery, the donor returns to a normal life. Aside from having to avoid a few medications, there aren’t any restrictions.

“I woke up after they were done, still on the operating table, and I’m like, ‘Where am I?’ and they said, ‘You’re in the Mayo Clinic in Phoenix. You just donated your kidney to a stranger.’ Apparently the first words out of my mouth were, ‘I did what?!’”

Lawrence spent one night in the hospital and was up and walking around the next day thanks to pain medications that he initially chose to forgo — a decision he wouldn’t recommend. He spent the following five days recuperating in a rented condo before his dad drove him back to New Mexico.

“My dad, who is a former Sandian — it was awesome what he did for me, and I would not have been able to donate without him,” Lawrence said,

adding that his dad had cooked and cared for him while he recovered. “My dad and I would watch movies every night, which was nice. It was a little chance to reconnect with him.”

Lawrence said he was thankful for his mom, as well. She stayed with him for four days after he returned to Albuquerque. During his recovery, he played video games, watched movies and was even able to walk his dog. Although he tired more quickly than usual, he got slightly better each day.

Lawrence returned to work just three weeks after the surgery. A week later, he said, “I feel fine now. I ran a 5k yesterday. I’m not quite where I was, but I’m back to basically normal. It’s amazing how quickly you can bounce back from having one of your organs taken out. You would not expect it.”

Inspired to help?

Lawrence hopes to inspire others to donate. “If you’re considering what to do with your limited amount of resources and time to help people, this really should be near the top of your list if you can swing the time off, which, at Sandia, you can.” He also said that although he didn’t use them, there are foundations that can help pay for expenses and lodging related to the procedure.

“Six people got new kidneys, and all it cost me was a terrible night in the hospital and kind of a bad week in Phoenix,” he said, reflecting on the experience. “It’s not nothing because it’s three weeks off work, but I don’t think I’m an especially special person. I thought about this a fair amount while I was lying in bed, thinking about why I did this. As far as I can tell, the only thing that makes me different than people who haven’t done this is that one day, I decided to fill out the form and pursue the process.”

National Donor Day is Feb. 14. Anyone interested in becoming a living organ donor can visit the National Kidney Registry at kidneyregistry.org or contact Lawrence for more information.

National Donor Day is Feb. 14



FAREWELL, KIDNEY — Following laparoscopic surgery to remove his kidney, Lawrence Allen spent just one night in the hospital and returned to work three weeks later. **Photo courtesy of Lawrence Allen**



CHAIN REACTION — Lawrence Allen chose to donate his kidney at the Mayo Clinic in Phoenix, Arizona, because they offer paired donation chains that result in multiple patients receiving organs, all starting from one anonymous donor. **Photo courtesy of Lawrence Allen**

Secretary of Energy Achievement Awards

By Julie Hall

Sandians were members of several teams honored in November by then Energy Secretary Rick Perry in a ceremony at DOE headquarters. The teams received Secretary of Energy Achievement Awards, which recognize significant achievements by DOE employees and contractors.

The Democratic People’s Republic of Korea Denuclearization team was recognized for its outstanding contribution in planning the final, fully verified denuclearization of the Korean peninsula. The team was instrumental in preparing for the historic U.S.-DPRK Summit in Singapore and the follow-up summit in Hanoi, Vietnam.

Sandia team members include Dianna Blair, Jay Brotz, Geoffrey Forden, Jen Gaudioso, Hans Oldewage and Aviva Sussman.

The High-Burnup Cask Demonstration Project team was recognized for its efforts to determine whether high-burnup fuel used in nuclear power plants to extract more energy from rods has different mechanical properties than low-burnup fuel, and whether the difference would involve increased risk for transportation and long-term storage and subsequent transportation.

Sandia team members include Charles Bryan, Sylvia Saltzstein and Ken Sorenson (retired). The NNSA Financial Integration team was recognized for developing a plan to improve and integrate the financial management of the Nuclear Security Enterprise, resulting in a clear and consistent cost structure for each NSE program that allows monitoring and analysis to compare the cost of work across the complex.

Sandia was singled out for being “instrumental in implementing Financial Integration to all NNSA programs supported at the Laboratories.” According to the award, “Sandia provided exceptional partnership with the NNSA Financial Integration team and is frequently used as a model for the NSE. Given the importance of this initiative, Sandia has streamlined the process, which has enabled NNSA to expand beyond NA-10 reporting and encompass other NNSA organizations.”

Sandia team members include Emily Barnhart, Theresa Chacon, Chris Dye, Lyle Lininger and John Moleres.

The Warhead Measurement Campaign team conducted analysis and modeling to “obtain a standardized set of radiation signature data from U.S. stockpile weapons to support treaty verification and emergency response studies, as well as other nuclear nonproliferation and defense program needs.” The team’s efforts resulted in a well-documented and consistent set of data that can be used for numerous future applications.



ROLE MODELS — The NNSA Financial Integration team was recognized for its efforts to develop and implement a clear and consistent cost structure for programs, monitor program execution and use the data to analyze programs and compare the costs of work across the Nuclear Security Enterprise. From left, Chris Dye, former Energy Secretary Rick Perry, Theresa Chacon and Lyle Lininger. Photo courtesy of DOE

Sandia team members include Luis Amezcua, Erik Brubaker, Michael Enghauser, Lee Harding, Kristin Hertz, Steven Horne, Patrick Hylton, Scott Kiff, Nathalie Le Galloudec, Peter Marleau, Amy Matteucci, Daniel McCarthy, Dean Mitchell, Sean O’Brien, Melinda Sweany, Lisa Theisen and Gregory Thoreson.

NNSA Principal Deputy Administrator visits Sandia



From left, NNSA Principal Deputy Administrator William Bookless and Associate Principal Deputy Administrator Dave Huizenga met with Sandia Deputy Labs Director Dori Ellis in January. The visit included tours of the Labs’ Weapons Display Area and Microsystems Engineering, Science and Applications Complex, as well as briefings on weapons and aerodynamics programs.

Photo by Randy Montoya



From left, NNSA Acting Deputy Program Executive Officer for Stockpile Modernization William “Scott” Handy, Sandia Deputy Labs Director Dori Ellis, NNSA Principal Deputy Administrator William Bookless, Sandia Labs Director James S. Peery, NNSA Special Assistant Jill Zubarev, Sandia Associate Labs Director for Nuclear Deterrence Steve Girrens and Sandia New Mexico Weapons Systems Engineering Director Jim Handrock.

Photo by Randy Montoya

Retiree Deaths		
May 24-Dec. 4, 2019		
Thurman "TJ" Allard (age 59)	May 24	
Kathleen Hook (96)	July 1	
Kenneth Payne (87)	July 1	
Billy Caskey (85)	July 6	
Norman Wagner (85)	July 8	
Cecil Mock (99)	July 8	
Vernon Havo (91)	July 12	
Mary Green (85)	July 14	
Tommy Sellers (84)	July 14	
G. Cook Story (74)	July 18	
Robert Esterly (93)	July 19	
Marlyn Diaz (64)	July 21	
Bruce Barnaby (97)	July 21	
Vicente Garcia (93)	July 22	
Carlton Scott (98)	July 24	
Richard Siebenforcher (89)	July 27	
Jessie Waddles (97)	July 29	
Robert Dungan (89)	Aug. 1	
Marvin Lynn Glaze (93)	Aug. 1	
Arbie Sue Hansen (87)	Aug. 3	
Andrew Quintana (83)	Aug. 4	
Johnny Stuckey (97)	Aug. 6	
Pauline Kassicieh (83)	Aug. 7	
Melvin Fimple (95)	Aug. 9	

Irving Hall (86)	Aug. 10
Robert Ernesto (69)	Aug. 12
Raymond Peabody (83)	Aug. 12
Patrick Xavier (57)	Aug. 13
Allen Church (91)	Aug. 17
Kenneth Kimball (83)	Aug. 18
Robert May (89)	Aug. 19
Edward Austin (86)	Aug. 22
William Schaedla (81)	Aug. 28
Daniel Hughes (63)	Sept. 5
Moreyn Cole (77)	Sept. 5
Alvin Brazda (88)	Sept. 6
Reuben Weinmaster (88)	Sept. 7
Joseph Sartori (81)	Sept. 8
William Cleland (83)	Sept. 19
Robert Clevenger (69)	Sept. 20
Leland Pierce (89)	Sept. 20
Donald Schubeck (92)	Sept. 20
Ronald Kamm (75)	Sept. 22
George Barbera (71)	Sept. 23
Brent Burdick (70)	Sept. 25
Gerald Rudolfo (72)	Sept. 27
Darlene West (65)	Sept. 29
William Nielsen (93)	Sept. 29
Charles Karnes (85)	Oct. 2
Robert Allen Freeman (65)	Oct. 3
Judith Lucero (81)	Oct. 3
Charles Shipley (85)	Oct. 4
Doyle Baker (87)	Oct. 4
William Atkins (90)	Oct. 4
Stanley Fraley (77)	Oct. 7

Veronica Russell (92)	Oct. 9
Charles Arning (87)	Oct. 12
Jacqueline Garratt (89)	Oct. 14
F. Sandoval (88)	Oct. 14
John C'De Baca (84)	Oct. 15
Vincent Zarrella (85)	Oct. 16
Debi Edwards (69)	Oct. 17
Dwight Soria (76)	Oct. 20
Seledon Jaramillo (92)	Oct. 20
Gladys Powell (86)	Oct. 20
Lois Hayes (97)	Oct. 24
W. Kendall Gentry (83)	Oct. 25
Frank Thome (81)	Oct. 25
Bridget Chorley (98)	Oct. 27
Jay Anderson (89)	Oct. 27
Duane Randall (92)	Oct. 28
Robert Klett (88)	Oct. 28
Barbara Carter (83)	Oct. 29
Ira Holt (89)	Oct. 30
Lawrence Anderson (68)	Nov. 2
Evelyn Ratcliff (95)	Nov. 3
W. Shoemaker (90)	Nov. 3
Emile Bernard (83)	Nov. 3
Louise Converse (96)	Nov. 4
Harrel Killebrew (97)	Nov. 13
W. Gamberale (88)	Nov. 23
Jack Williams (92)	Nov. 23
Viola Pino (81)	Nov. 26
Lorraine Elliott (79)	Nov. 28
Darrell Green (89)	Nov. 30
Leo Scully (84)	Dec. 4

Building Sandia

Part 2 of 3-part series on Labs architecture.

This article focuses on the functions and needs that drove the construction of buildings and facilities at the Labs up through the mid-1990s. See Part 1 in the Nov. 7, 2019, issue of Lab News for more on the Labs’ architectural history. Watch for Part 3 later this year.



In 1964, Sandia stood up the Labs’ first pulsed power machine at its Albuquerque campus. Today, the Pulsed Power Facility and campus in Tech Area IV is home to Saturn, back right, and the Z machine, back left, originally Particle Beam Fusion Accelerators I and II, respectively. Tech Area IV also houses two of Sandia’s clone buildings.

Photos courtesy of Sandia National Laboratories

By **Karli Massey** and **Jennifer Sawayda**

By the late 1960s, Sandia’s new facilities were up and running, and sufficed for the stockpile at the time; therefore, building activities in the nation’s nuclear weapons complex generally slowed in comparison to the building boom of the 1950s.

“In the subsequent four decades, Sandia was constructing facilities primarily in response to diverse program needs that ranged from the advancement of nuclear deterrence to energy research,” said Sandia historian Rebecca Ullrich. “The new buildings were focused primarily on function.”

The development of radiation-hardened components for nuclear weapons pushed researchers to create test environments simulating conditions of nuclear detonation. Sandia began construction on reactor facilities in the late 1950s. Similarly, pulsed power technology started taking shape in the 1960s, with the need to simulate bursts of radiation. Sandia stood up its first pulsed power machine in 1964, and additional machines followed.

In 1977, the groundbreaking for the Electronic-Beam Fusion Facilities marked the opening of what is now Sandia’s pulsed power campus in Tech Area IV in Albuquerque. Today, six anchor facilities support Sandia’s pulsed power program.

The centerpiece of the pulsed power program is the historic Building 983, which houses the Z machine, the world’s most powerful and efficient laboratory radiation source. The building, originally constructed in 1985 as the Particle Beam Fusion Accelerator II, is a high-bay facility erected with double-tee panels. The inside screen rooms are made of copper to keep electromagnetic pulses from impacting the electronics in the rest of the facility. Particle Beam Fusion Accelerator I in Building 981 houses Saturn, the predecessor to the Z machine.

Many other facilities constructed in the 1960s and 1970s were designed specifically for environmental testing support and built in Albuquerque’s remote Tech Area III and Coyote Test Field.

Adding to the area’s drop tower, “slingshot,” and sled track were additional explosive test facilities, the aerial cable facility, Thunder Range shock tubes and the burn site.

Energy research facilities

In 1971, Congress authorized the Atomic Energy Commission to undertake research on the nation’s energy needs. Sandia responded, initiating a broad range of energy research programs.

In 1978, the National Solar Thermal Test Facility was commissioned. One of the first of Sandia’s user facilities, in which Sandia partners with outside entities to conduct testing, the site is home to the world’s first multimewatt solar tower and is the only large-scale high-flux testing facility in North America.

The tower is a 200-foot high concrete structure that supports testing for concentrating solar power experiments. The tower houses a 400-ton elevating module for lifting experiments to the top. Over the years, the site has been developed to offer other energy testing facilities, including a large field of optics, a solar furnace, a rotating platform for solar concentrators, an indoor optics lab, an automated robotic solar simulator for materials and coatings testing and a large molten salt test loop.

Also motivated by the energy crisis, Sandia’s Combustion Research Facility in Livermore, California, was built for laboratory scientists who sought to apply laser diagnostic techniques from the nuclear weapons program to understand the fundamental chemical and physical processes that govern internal engine combustion efficiency and emissions. Since the CRF opened in 1980, researchers have partnered with industry, universities and other institutions around the world to conduct combustion experiments and modeling.

The CRF complex was developed in two phases. Originally designed around a unique facility laser that piped laser light into 20 different labs, the complex eventually expanded to 36 labs, each with its own modern laser systems.

The CRF office building features curved concrete exterior stairwells and seismic buttresses that extend out from the metal skin. In 2010, a fifth CRF building was added to accommodate the need for combustion research computation and visualization. Over the years, this state-of-the-art facility with its custom-built laser diagnostics has enabled researchers to advance the science of combustion, impacting the design of modern engines and industrial burners.

Rise of the clones

In 1980, the overall aesthetic of Albuquerque’s Tech Area I was redefined with the construction of



The National Solar Thermal Test Facility was commissioned in 1978 and is now home to various other test facilities that support energy research.



Looking southeast beyond Sandia’s original brick administration building (Building 800, bottom left), three of the six “clone” buildings in Tech Area I showcase the Brutalist style of architecture.



Five buildings comprise California’s Combustion Research Facility, first opened in 1980. The newest building, left, was constructed in 2010.

several similar buildings that supported expanded activities in security and sensing technologies, as well as manufacturing support.

By 1984, four “clone” buildings were erected. These buildings were multi-storied and designed like boxes to allow for flexibility in use as both administrative office space and lab space. Up through 1997, five more clone buildings were constructed in Albuquerque and one in Livermore. The nine clone buildings provide 1.1 million gross square feet of space and house nearly 2,100 workers.

Having these structures look and function similarly helped ease the process of obtaining congressional funding. In addition, lessons learned from each clone build were applied to the next. The clones were designed in the Brutalist architectural style. Defined by large, block-style buildings using geometric shapes and poured concrete, Brutalism first emerged in educational and government buildings in the mid-20th century, mainly due to the low cost and ease of construction.

In the clones, the shells were constructed first, followed by specific occupancy design and build-out. Unique architectural characteristics were added to the generic concept on some buildings, such as the Center for National Security and Arms Control, which includes a separation wall with mirrored systems on both sides. Columns were added to the Integrated Materials Research Lab to strengthen the structure to meet vibration requirements for the experiments conducted in the lab.

“Following this Cold War era of building and construction, we start to see an increased emphasis on making the campus more attractive to new recruits and visitors,” Rebecca said. “The decade leading up to the second millennium reveals a conscious shift to having the site and its buildings convey a stronger image of Sandia’s focus on science and technology.”

Record-smashing roadster

CONTINUED FROM PAGE 1

of it handmade, including the fuel-injected, turbo-charged engine, two onboard computers (one to control the engine and one to log data) and the long, narrow, royal blue body that sits low to the ground.

“I fell in love with land-speed racing at Bonneville because, for me personally, it was all about beating a standard — the clock — through the best design I could create,” Joel said.

The desert can easily exceed 100 degrees, and Joel was wearing a 50-pound fire suit for safety. To stay cool, he had modified the engine’s cooling system to run through his suit, refrigerating his long johns.

An official waved him forward, and Joel rolled his foot onto the gas.

“You’re just part of the equipment at that point,” he said.

It took him about 60 seconds to reach top speed. At 100 mph, Joel shifted out of first gear. At 220 mph, fifth gear, he was still building momentum as mile markers flashed by. The car has an open cockpit, so during time trials, the wind knocks his helmet around. “But if the car is designed and built right, things go well,” he said. “Otherwise, driving is a handful.”

After five miles, Joel reached the end of the course and deployed a parachute to slow down. His father drove over to pick him up and analyze the run.

A splash of water on the side of the car caught their eyes. The engine was leaking coolant. Not knowing the cause, they weighed the risks of taking the car out for a second run. If the cooling system over pressurized, it could explode and douse Joel with boiling hot water. Hence the fire suit.

They called it quits. Joel’s top speed: 255 mph. The Southern California Timing Association record: 257 mph.

Philosophy of race engineering

The first day father and son ever watched races together at the salt flats, nine years ago, it wasn’t the speed that grabbed their interest. They ended up talking all that day about aerodynamics,



RAD RACER — The Wirths’ fully assembled racecar sits parked at the Bonneville Salt Flats racetrack in Utah, where they compete each year to set land speed records in the Model T car class. **Photo courtesy of Joel Wirth**

thermodynamics, downforce, weight and balance. They philosophized about engine design, debated tire management and at the end of the meet, Joel turned to his father and said, “I think I want to do this.”

“I understand why,” Jack Wirth said.

It initially took them 1½ years, working almost daily, to dismantle a derelict racecar and rebuild it. Now, they focus on fixing relatively minor flaws, including the faulty gasket that spoiled their 2018 run.

“We keep working to improve. That’s the bottom line,” Joel said, adding that the engineering challenges of their hobby are an emotional draw.

When he discovered that a diagnostic sensor was negatively affecting the car’s performance, Joel had to teach himself chemistry to understand the reaction inside it that was causing the problem. When he’s pressed for time or money, he makes critical decisions about which problems to fix and which to leave for another day.

These experiences, Joel said, help him reflect on the human factors of engineering — not just the mechanical ones — and empathize with his Sandia team facing similar challenges.


Jack Wirth has grown poignantly aware of logistics and the need to keep operations simple. He isn’t just his son’s crew chief — at times

he’s the entire crew. Transporting the car and all the equipment they need for a race takes careful planning, and sometimes it means enlisting help from friendly, supportive members of their racing community.

The Wirths returned to Bonneville in September 2019 for World of Speed, one year after coming up just shy of the record. This time, the car worked perfectly. As his howling engine turned heads across the flats, Joel knew before he had even finished the race that he had clinched a new Utah Salt Flats Racing Association record.

His speed: 274 mph, smashing the previous record by 17 mph, which was a startling jump in a community that normally sees records set by smaller margins, especially when they’re set by people working out of a home garage. Officials checked the car for compliance, and the next day the Wirths made a second run. Even faster: 278. The record observed by the Southern California Timing Association is the average of both runs, 276.7 mph.

To Joel, the more significant accomplishment is what he and his father made together.

"It’s a great opportunity to build a special relationship with your dad.” 

SANDIA CLASSIFIED ADS

NOTE: The classified ad deadline for the Feb. 28 Lab News is noon Friday, Feb. 21.

AD SUBMISSION GUIDELINES

AD SUBMISSION DEADLINE: Friday noon before the week of publication unless changed by holiday.

Questions to Michelle Fleming at 505-844-4902.

Submit by one of the following methods:

- **EMAIL:** Michelle Fleming (classads@sandia.gov)
- **FAX:** 505-844-0645
- **MAIL:** MS1468 (Dept. 3651)

- **INTERNAL WEB:** Click on the News Tab at the top of the Techweb homepage. At the bottom of the NewsCenter page, click the "**Submit a Classified Ad**" button and complete the form.
- Due to space constraints, ads will be printed on a first-come, first-served basis.*

MISCELLANEOUS


- BREWING EQUIPMENT:** 1/2-hp SS pump, 3 ea.; 15.5-gal. kegs, 3 ea.; carb stones, 7 ea.; 1.5-in. SS butterfly valves; 1.5-in. SS tri-clamps, more. Lee, 505-350-2809.
- RV HITCH,** new, Anderson Ultimate 5th wheel connection, w/pin box coupler, see at: tinyurl.com/vwz59tz, \$650. Schaub, 575-535-4067.
- MOVING BOXES,** 51 total, various sizes (1.5, 3.0, 4.5, 5.1 cu. ft., wardrobe), free. Makarewicz, makarewicz.philip@gmail.com.
- TWIN XL BOX SPRINGS,** 2, like new condition, 2 yrs. old, \$300/both. North, 505-715-7430.
- OFFICE TROUSERS,** 6 pr., Worthington Curvy Fit, ladies size 8, various colors, <1 yr. old, \$5 ea. OBO. Lauben, 505-980-2915.
- FOLDING LADDER,** w/ casters, Little Giant, 22-ft., \$200; PSE compound bow, RH, #50-#65, ready to shoot, \$850. Schroeder, 505-917-4516.
- JOIN FABULOUS FELINES,** for their Wild Love Valentines celebration, details at fabulousfelines.org. Stubblefield, 505-263-3468.
- POOL TABLE,** w/cues, 7-ft., bar-style, you haul, \$150. Eilers, 505-286-4013.
- NINTENDO SWITCH,** w/3 games, Kirby Star Allies, Pokken Tournament Dx, Super Smash Bros. Ultimate, \$375 OBO. Ruiz, 505-280-7077.
- GROW LIGHT GARDEN CART,** adjustable lights, over 3 tiers, 48”H x 20”D x 50”W, on casters, extra lights, \$200. McNiel, 505-250-2029.
- PITCH FORK, LONG HANDLE SICKLE,** full size, antique, rustic farm equipment, used for home décor, photos available, \$150. O’Grady, 720-587-9875.
- DINING CHAIRS,** 6, solid wood, whitewashed, w/ beige on beige upholstery, 2-armed, \$250. Harris, 505-835-0574, cindyjoeharris@yahoo.com.
- PHONE & PLAN,** TracFone ZTE, Majesty ProPlus LTE, original box, never activated, w/\$15 air time, \$20. Wagner, 505-504-8783.
- SANDIA MEMORIAL GARDENS,** 2 plots (2 plots apart), Masonic east end, both have 2nd rights, \$1,400 ea. Campbell, 505-620-5369.
- DINING SET,** elegant Astoria Grand style, table w/1 leaf, 7 chairs, 2-pc. china cabinet, excellent condition, \$1,500. Serna, 505-730-7028.


REAL ESTATE

- 4/5-BDR. HOME,** 3 baths, 3,161 sq. ft., Montecito Estates, D.R. Horton, green built, immaculate, move-in ready. Delgado, 505-328-5277.
- 2-BDR. CONDO,** 2 baths, NE Heights, close to foothills & trails, great location, HOA fees apply, no FHA loans. Garcia, 505-615-8437.
- WANTED**
- GOOD HOME,** 12-yr. old lab/collie mix, mom is sick, dog needs new home, sweet, quiet, gentle. Sugar, Jdsugar@gmail.com.
- TRANSPORTATION**
- ’66 FORD F100,** 351 Windsor, <500 miles, AT, power steering/brakes, more, \$7,500. Howard, 505-296-6056.
- ’17 FORD F250 PLATINUM,** diesel, 4x4, <14.8K miles, Tonneau cover, BedRug bed liner, \$63,600. Brewer, 505-604-7546.
- ’13 FIAT SPORT 500,** silver/red, new windshield & tires, 66K miles, runs great, excellent condition. Lujan, 505-220-8268 or 505-873-1800.
- ’83 VW VANAGON GL,** water-cooled 1.9L, 4-spd. manual, good upholstery/tires, nice patina, runs, manuals, make offer. Hatley, 505-830-0469.
- ’09 HONDA FIT SPORT,** AT, 113K miles, extra set of rims w/snow tires mounted, \$4,500. Fellet, 314-761-1485, call or text.
- ’18 GMC SIERRA 1500** SLT, 5.3L, 4x4, crew cab, w/SLT premium pkg. & Z71 off-road pkgs., ~13K miles, \$39,500. Rahimian, 505-385-5638.
- ’06 TOYOTA SOLARA SE,** 2-dr., 113,660 miles, very good condition, \$3,950. Allen, 319-230-9529.
- ’19 HONDA ACCORD,** 2.0 T sport, MT, sunroof, 14K miles, \$28,000. Valerio, isaac.l.valerio@gmail.com.
- ’08 HONDA ACCORD** EX-L, V6, leather, sunroof, new brakes, clean Carfax, 48K miles, runs/looks perfect, \$8,600. Torres, 505-508-6795.

AD RULES

- | | |
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| 1. Limit 18 words, including last name and home phone (web or email address counts as two or three words, depending on length). | 8. No commercial ads. |
| 2. Include organization and full name with ad submission. | 9. For active Sandia members of the workforce and retired Sandians only. |
| 3. Submit ad in writing. No phone-ins. | 10. Housing listed for sale is available without regard to race, creed, color or national origin. |
| 4. Type or print ad legibly; use accepted abbreviations. | 11. Work wanted ads are limited to student-aged children of employees. |
| 5. One ad per issue. | 12. We reserve the right not to publish any ad that may be considered offensive or in poor taste. |
| 6. The same ad may not run more than twice. | |
| 7. No “for rent” ads except for employees on temporary assignment. | |





Read to Me!
ABQ NETWORK


2020 CHILDREN'S
BOOK DRIVE
February 18 – March 3

Donate new or gently used children's books.
(English, Spanish & Bilingual)

Drop-off Locations
Ask your OAA/OMA/SMA/EA about drop-off locations in your area. Donations can also be dropped off at IPOC Main Lobby or any Sandia Laboratory Federal Credit Union locations.

Questions?
Roberta Rivera, Community Involvement: 505-284-5211


Other ways to help?
Email: BOOKDRIVE66@gmail.com




Mileposts




*New Mexico photos by Michelle Fleming
California photos by Randy Wong*




Leonard Convisor 40




Robert Rechar 40




Tony Bertram 20



Marcus Knudson 20



Thomas Nelson 20



Daniel Wilcox 15

Recent Retirees



*New Mexico photos by Michelle Fleming
California photos by Randy Wong*



Walt Nickerson 39



Kevin Davidson 37



Frank Lucero 35



Mike (Mac) McDuffie 33



Irene Bentz 30



Thomas Grasser 30



Larry Luna 28



Cheryl Herrera 25



Tim Mooney 22



Ellan Anderson 20

Cooling unit saves water

CONTINUED FROM PAGE 1



INSIDE LOOK — Engineering project lead David J. Martinez stands inside the first thermosyphon cooler installed on the roof of Sandia's supercomputer center.
Photo by Randy Montoya

Removing that thermal energy is expensive, either in the financial cost of powering mechanical cooling units or in the amount of water needed to replace that portion deliberately evaporated to cool the remaining water. Neither choice is a plus for the environment.

The thermosyphon cooling unit intercedes passively. Its refrigerant rests in a shell that surrounds an outgoing pipe like a glove on a hand, absorbing heat until the liquid evaporates into a gas, like boiling water becomes steam. The gas rises in vertical pipes until it reaches the upper limits of the device. There, it gives up its acquired heat to the atmosphere, coalesces back into liquid and sinks down, ready to cool again.

The cycle needs minimal maintenance. It works as long as the atmospheric temperature is less than that of the refrigerant; otherwise, the heat transfer goes the wrong way, from the atmosphere into the coolant.


In New Mexico, the system works for three seasons, but in summer, only at night. On hot summer days, the thermosyphon shuts down and water must be pumped to a mechanical chiller and then to a cooling tower, which evaporates water like sweat from a body into the atmosphere.

Because minerals don't evaporate, the remaining water, recycled, has a higher concentration of contaminants, which means it frequently must be changed out, like oil is periodically changed on a vehicle before it fouls the cooling pipes. The evaporated and discarded water must be replaced. Those problems are almost eliminated with the new system.

Saving more than money

The solution is not cheap. Thermosyphons cost \$200,000 each from their manufacturer, Johnson Controls. Sandia has installed one, bought two more, and may buy a fourth. For four units, annual cooling costs would drop, according to Dave's estimates, from \$181,000 to \$116,000, which means a roughly 10-year payback in current dollars.

The real saving would come in water: "When the data center reaches full design load, each thermosyphon unit will be capable of saving over 4.2 million gallons of water per year," he said.

Dave won a DOE energy award last year for working on a far smaller version of the same type of system with the National Renewable Energy Lab in Golden, Colorado. 

SunPower partnership sparks new solar module

Leading US solar manufacturer visits NM Regional Test Center to see experimental photovoltaic system in action

Story by **Kelly Sullivan**
Photos by **Brett Latter**

Representatives from SunPower Corp., a leading U.S. solar manufacturer and global competitor, recently visited the New Mexico Regional Test Center, co-located with Sandia’s Photovoltaic Systems Evaluation Laboratory, to inspect their company’s experimental PV system.

Laurie Burnham, Sandia scientist and principal investigator for the Labs’ RTC project, organized the event, which included a stop for the SunPower team at the Nevada RTC before touching down in New Mexico, and then heading to the Florida RTC.

“We always encourage our RTC partners to visit Sandia. In-person meetings build trust, promote the exchange of information and — quite frankly — result in most visitors being wowed by PSEL’s technical capabilities,” Laurie said.

“In addition, the partnerships we establish through the RTC program represent a win-win: U.S. manufacturers gain access to the expertise and resources of the national labs, and Sandia gets a front seat to industry innovation, which in turn creates opportunities for cutting-edge research that supports the entire solar industry.”

SunPower has been an RTC partner for the past five years, initially asking Sandia to validate an early version of their bifacial (two-sided) module technology. Since then, Sandia and SunPower have collaborated on two generations of SunPower’s shingled-cell modules, known as the P-Series.

The shingled design represents a fundamentally new approach to module architecture that enables more power output for the same size module, has the potential for high reliability and performs well when modules are partially shaded.

Solar research support

The half-day New Mexico visit by SunPower Senior Module Performance Engineer Adam Hoffman and Field Engineer Fabrizio Farina included an overview of Sandia’s current PV projects — Optimized Bifacial PV Systems, PV Proving Grounds, PV CAMPER and Snow as a Factor in Photovoltaic Performance and Reliability, among others — followed by a wide-ranging discussion of how research can best support the nation’s transition to advance a solar-intensive future.

During his visit, Hoffman provided an informal presentation of the challenges and opportunities facing the solar sector from a manufacturer’s perspective, including an overview of the company’s research and development interests and a description of their outdoor testing facility in Davis, California. Hoffman also emphasized their interest in collaboration.

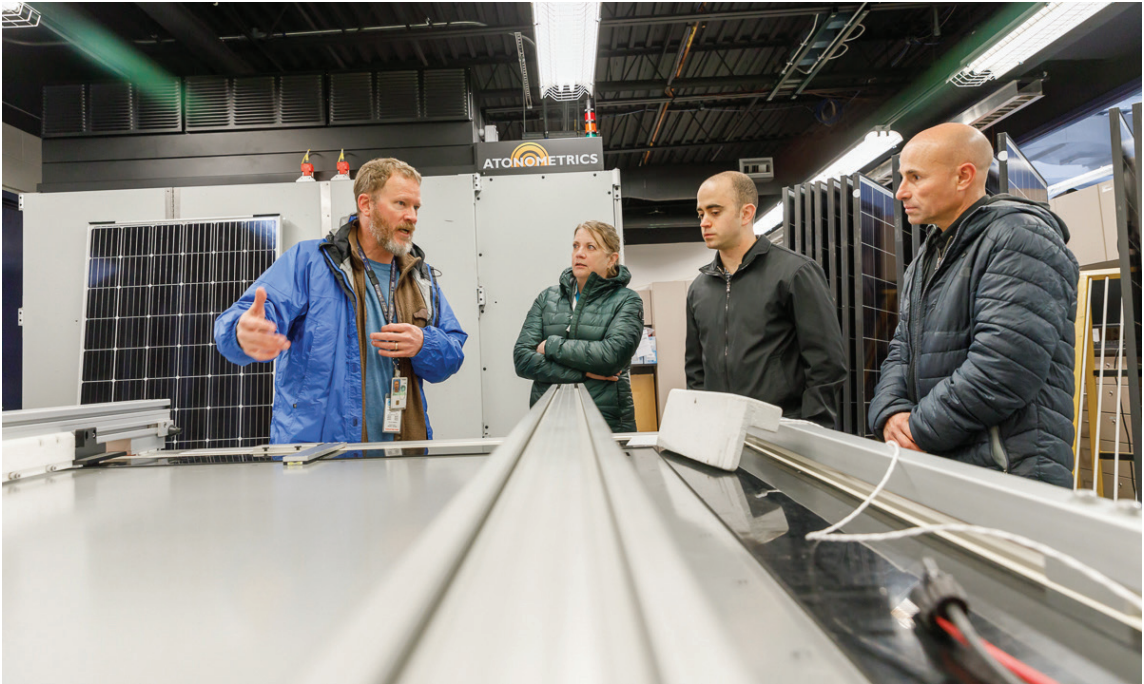
“Data from the RTC sites has been highly valuable in demonstrating how SunPower’s innovative module technologies perform in the field and in different climates,” Hoffman said.

“Sandia has been a fantastic partner on a variety of projects over the years. The Sandia team has truly world-class expertise, and we are grateful for their support of the solar industry. It was a productive visit and meeting for both parties, and I look forward to continuing our collaboration,” he said.

The meeting concluded with the visitors and researchers braving ice, wind and snow for a tour of Sandia’s PSEL facility. Technical Director Bruce King guided the guests through the site, which



SOLAR FUTURE — From left front, Sandia scientists Laurie Burnham and Bruce King and SunPower engineer Adam Hoffman discuss the photovoltaic manufacturer’s next-generation PV system, which is being evaluated at the New Mexico Regional Test Center, as well as at RTCs in Nevada and Florida. Behind the group, SunPower engineer Fabrizio Farina inspects the RTC monitoring system.



SIMULATING SOLAR — From left, Sandia scientists Bruce King and Laurie Burnham discuss the technical capabilities of the solar simulator at Sandia’s Photovoltaic Systems Evaluation Laboratory with SunPower engineers Adam Hoffman and Fabrizio Farina.



SYSTEM FEATURES — From left, Fabrizio Farina, Laurie Burnham, Adam Hoffman and Bruce King discuss some of the unique features of Sandia’s Photovoltaic Systems Evaluation Laboratory.

included an extended stop at the SunPower experimental system.

DOE RTC program

The NM RTC is one of four regional centers throughout the country and part of the larger DOE RTC program. The DOE Solar Energy Technologies Office established the state-of-the-art technical platform in 2012 to validate the performance and reliability of emerging PV technologies across multiple climates and increase investor and consumer confidence in new, more efficient products.

The program allows for the rigorous evaluation of proprietary technologies under realistic field

conditions, enabling the cross-climate comparison of solar technologies. To ensure data quality, each RTC has a common infrastructure, including world-class meteorological instrumentation, high-resolution monitoring equipment and operating protocols.

To learn more about Sandia’s involvement with the DOE Regional Test Center Program, contact Laurie Burnham or visit Sandia’s RTC program website at rtc.sandia.gov.

To learn more about Sandia’s Photovoltaic Systems Evaluation Laboratory, contact Bruce King or visit the PSEL webpage on energy.sandia.gov. 